CHAPTER 16

Cough

Roger Paulman

Coughing is a physiologic response to real or perceived irritation of the respiratory system. It is described as an "explosive expiration" that can be a voluntary act or facilitated by a reflex arc. Irritants, either endogenous or exogenous, such as dust, smoke, secretions, or refluxed gastric acid, stimulate the sensory fibers triggering the cough reflex. Numerous conditions can cause a patient to present to the physician's office with the chief complaint of cough.

As with other conditions in medicine, a good history and physical examination will help sort through the differential diagnosis of cough. Important historical questions to ask include:

- Onset—Is this an acute or chronic problem?
- Associated symptoms—Other URI symptoms, heartburn, wheezing, etc.?
- Seasonality—Is there a certain time of year?
- Sputum production—Quantity, color, or associated hemoptysis?
- Fever?
- Underlying medical conditions—Immunocompromised, medications?
- Associated dyspnea, orthopnea?

Workup

- Complete auscultation of the lungs and heart
- Ear, nose and throat examination
- Lower extremity examination for edema
- Imaging may be of help in determining the etiology of a patient's cough
- Simple PA and lateral chest x-rays may reveal pneumonia, pulmonary edema, lung mass, etc.
- Pulmonary function testing is helpful in the case of chronic lung disease to determine restrictive versus obstructive processes and determine severity of disease.
- Further testing may include chest CT and bronchoscopy when warranted.

ASTHMA

Many patients present for initial visits for asthma complaining only of cough (see Chapter 38).

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CANCER

Comprising 28% of all cancer-related deaths, lung cancer is the leading cause of cancer death in the United States. Cigarette smoking is thought to be involved with 87% of cases. Although this is the majority of cases, occupational and environmental exposures, nutrition, and genetics are all thought to play a role. Lung cancer can be divided into small-cell, non–small-cell, and miscellaneous cancers. The presentations of lung cancer can vary based on the type and location of the lung mass (Table 16-1).

Symptoms
- Cough
- Hemoptysis
- Dyspnea
- Chest wall pain (peripheral tumors)

Signs
- Pleural effusion
- Pneumonia
- Stridor
- Unilateral wheezing
- Clubbing
- Horner syndrome (apical tumors)
- Paraneoplastic syndromes (Eaton-Lambert syndrome, syndrome of inappropriate antidiuretic hormone [SIADH], parathyroid hormone–like substance secretion, DIC)

Workup
- Lung mass on chest x-ray
- Location and characteristics of mass and associated metastasis on CT scan
- Bronchoscopy with biopsy on central lesions
- Transthoracic needle biopsy under fluoroscopic guidance

Comments and Treatment Considerations
Treatment of lung cancer depends greatly on the type and stage of the tumor. Non–small-cell cancer treatment relies on surgery, with chemotherapy and radiation being adjuncts. Small-cell lung cancer has a poor prognosis, with chemotherapy combined with radiation being mainstays of treatment.

Table 16-1. Classification of Lung Tumors

Small-cell lung cancer	Oat cell, intermediate cell type, and combined oat cell carcinoma
Non–small-cell lung cancer	Squamous cell, adenocarcinoma, large-cell carcinoma
Miscellaneous tumors	Adenosquamous, carcinoid, bronchial gland

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Although one's history and physical examination along with diagnostic testing usually lead to a diagnosis, sometimes medications can be the cause of a patient's complaints. Many medications may cause vague symptoms such as cough and one should be aware of a patient's recent changes in pharmaceuticals and over the counter medications (OTC) and supplements. Recent changes in dosing or addition of medicines should be noted. The most notable class of medications to cause chronic coughing is the ACE inhibitors. This class causes a nonproductive, dry cough that resolves with discontinuation of the medication.

CONGESTIVE HEART FAILURE

Heart failure is a broad term that encompasses diastolic, systolic, and high output failure. It is a condition in which the cardiac output cannot keep up with the metabolic needs of the rest of the body. Symptoms of congestive heart failure (CHF) arise from the fluid overload and subsequent pulmonary edema following activation of the renin-angiotensin system, and ensuing fluid retention. Systolic dysfunction arises from the heart's inability to contract properly to circulate adequate volumes of blood. Diastolic failure stems from a stiff, noncompliant ventricle and elevated ventricular filling pressure. High-output heart failure is uncommon and results from shunting or an increase in metabolic needs of the body tissue.

COMMON CAUSES OF HEART FAILURE

Cardiomyopathies, MI, pericardial effusion, infiltrative disease (amyloid, hemochromatosis), hypertension (systemic and/or pulmonary), valvular disease, anemia, hyperthyroidism, and shunts can cause heart failure.

Heart failure can be further classified as right or left sided. A patient's presenting symptoms and examination can lead the examiner to the diagnosis.

Left-Sided Heart Failure

Symptoms

- Cough +++
- Paroxysmal nocturnal dyspnea
- Orthopnea
- Dyspnea on exertion +++

Signs

- Crackles on auscultation (heard on cardiac auscultator)

Right-Sided Heart Failure

Symptoms

- Leg swelling +++

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Signs
- Jugular venous distention
- Enlargement of the liver
- Ascites
- Peripheral edema

Workup
- Laboratory and radiologic testing can lend evidence toward the diagnosis of heart failure.
- Chest x-ray may show fluffy infiltrates of interstitial edema with increased prominence of the cephalad pulmonary vasculature.
- Cardiomegaly, which may also be found on chest x-ray, is defined as a heart size greater than half of the diameter of the thoracic cavity.
- Brain natriuretic peptide (BNP): The ventricles in response to increased stress on the myocardium produce this peptide.
- Echocardiography is the best noninvasive modality for measurement of ventricular size as well as function.

Comments and Treatment Considerations
Although orthopnea can be seen in chronic lung disease, it is caused by increased venous return from the lower extremities and subsequent pulmonary congestion when lying supine. Paroxysmal nocturnal dyspnea can be a sign of poorly compensated heart failure and is characterized by sudden onset of shortness of breath while asleep and is relieved by sitting up or standing.

Treatment of heart failure can take may forms. Lifestyle modification is important. Cessation of smoking, dietary modifications, and cardiac rehabilitation all play a significant role.

Initial treatment of acute decompensation includes diuretics such as furosemide (Lasix). Morphine can be used in the instance of pulmonary edema for vasodilation and as an anxiolytic. Vasodilator medications such as ACE inhibitors and angiotensin receptor blockers have decreased mortality when used in patients with decreased function. ACE inhibitors can also cause cough as a side effect.

Beta-blockers have been shown to decrease mortality in patients with heart failure. Doses should be administered in the "start low and go slow" manner to avoid acute worsening of heart failure.

Inotropic agents like digoxin have long been used to decrease symptoms, but have not shown to decrease deaths from heart failure.

Implantable cardiac defibrillators should be considered in patients with low ejection fractions, because arrhythmias are a large cause of mortality.

GASTROESOPHAGEAL REFLUX DISEASE

Patients experiencing reflux symptoms may come to the physician's office complaining only of chronic cough initially. Refluxed gastric contents cause irritation of the pharynx, and occasional aspiration of the acidic fluid can lead to laryngeal irritation (see Chapter 26).

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PNEUMONIA/BRONCHITIS

Pneumonia is an infection of the lung parenchyma. Patients usually complain of fever and cough with or without sputum production. Emerging resistance of bacteria to typical antibiotics has led to classification of the origination of the infection.

Symptoms

- Cough ++++
- Dyspnea ++++
- Sputum production +++
- Chest pain +++
- Hemoptysis ++
- Confusion ++
- Fever

Signs

- Pain may be the only initial complaint, with chest, back, and abdominal pain being common locations.
- Derangements of the vital signs such as tachycardia, tachypnea, and fever may draw your attention toward pulmonary infection.
- Percussion of the chest may reveal dullness over the area of consolidation.
- Auscultation of the chest may show rales or crackles over the infection as fluid collection increases.
- Classic findings such as egophony, whisper pectoriloquy, and tracheal breath sounds may not be initially present, but can develop as the pneumonia progresses.
- Laboratory findings such as elevated WBC counts with bandemia suggest an infectious process.

Workup

- Consider blood cultures on hospitalized patients per some recommended guidelines, though they rarely affect treatment. A basic chemistry panel is helpful to explore electrolyte imbalances.
- Chest radiographs are useful in determining the type and location of community-acquired pneumonia.
- Typical and atypical pneumonias are caused by different organisms and have different presentations (Table 16-2).

Treating patients in the hospital rather than as outpatients requires good clinical judgment along with other evidence such as vital signs, x-ray findings, and laboratory results. Management of community-acquired pneumonia lies with a second-generation cephalosporin plus a macrolide (to cover atypicals) or a respiratory fluoroquinolone. In some areas, vancomycin is required to cover resistant *S. pneumoniae*. Physicians should consult their local laboratory for geographic resistance patterns and their local hospital protocols for treatment of patients who are immunocompromised, older adults, or have hospital- or ventilator-acquired pneumonia.

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Table 16-2. Characteristics of Typical and Atypical Pneumonia

	TYPICAL	ATYPICAL
Organisms	*S. pneumoniae* *Haemophilus pneumoniae* *Legionella*	*Mycoplasma* Viral *Chlamydia*
Onset	Sudden	Gradual
Cough	Productive Occasionally bloody	Paroxysmal Nonproductive
X-ray findings	Lobar consolidation	Diffuse involvement

Acute bronchitis shares many of the clinical features of pneumonia, but lacks the radiologic findings. It is thought to be infection or inflammation of the tracheobronchial tree. It is characterized as cough, production of sputum, with normal chest x-rays. Most commonly, bronchitis in adults is caused by viral infection (respiratory syncytial virus [RSV], rhinovirus, adenovirus, coronavirus), but can be caused by bacteria *(Chlamydia pneumoniae, Mycoplasma pneumoniae, Bordetella pertussis).* Routine use of antibiotics in the treatment of otherwise healthy individuals with acute bronchitis is not recommended. The vast majority of these cases are viral and self-limited. Smokers should be encouraged to stop. Symptomatic treatment is recommended and can include inhaled bronchodilators for bronchospasm. If pertussis is suspected, proper testing should be done for confirmation and antibiotics used for prevention of transmission. Agents effective against pertussis include erythromycin, clarithromycin, and TMP-SMX.

TUBERCULOSIS

A large problem worldwide, tuberculosis infects 8 million new people every year and causes 2 to 3 million deaths yearly. The incidence in the United States is currently 6.5/10,000 with higher incidence in African Americans and Hispanics. One should consider tuberculosis as a diagnosis in the homeless and immigrant population.

Caused by the acid-fast bacillus *Mycobacterium tuberculosis*, this infection begins with inhalation of aerosolized droplets containing the bacteria. Infection initially starts in the lung, but can spread via the bloodstream to the liver, bone, and kidneys among other organs. After an initial asymptomatic infection, most patients will have latent infection in which a skin test will be positive and calcifications of the lung parenchyma can be seen on chest x-ray. Risk factors for active tuberculosis include:

- HIV coinfection
- Recent weight loss (alcoholism, malnutrition)
- Diabetes
- Immunosuppression (medications, cancer, acquired immunodeficiency syndrome [AIDS])

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Symptoms
- Cough (productive of purulent sputum)
- Malaise +++
- Weight loss
- Low-grade fever
- Dyspnea
- Chest pain

Signs
- Crackles on lung auscultation
- Tachypnea
- Fever
- Diminished breath sounds (pleural effusion)
- Lymphadenopathy

Workup
- Upper lobe infiltrates
- Cavitary lesions
- Hilar lymphadenopathy
- Positive purified protein derivative (PPD)
- Acid-fast bacilli on sputum smear

Comments and Treatment Considerations
Treatment of patients with active tuberculosis (TB) begins with isolation of the patient in a negative-pressure room. Because tuberculosis can become resistant to monotherapy, treatment with the four-drug regimen listed below takes place for the first 2 months. Then treatment with isoniazid and rifampin continues for a total of 6 months. TB in the immunocompromised patient continues for 9 to 12 months. In noncompliant patients, direct observed therapy can be set up through the health department to ensure treatment. Hepatitis is a major side effect of isoniazid treatment and liver enzymes should be monitored frequently.

For drug tuberculosis treatment, consult infectious disease specialists for local recommendations, follow-up, and dosing:

Isoniazid	5 mg/kg/day (max 300 mg)
Rifampin	10 mg/kg/day (max 600 mg)
Pyrazinamide	15 to 30 mg/kg/day (max 2 g)
Ethambutol	15 to 25 mg/kg/day (max 2.5 g)

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